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ABSTRACT

Traditionally, blacks have been underrepresented in scientific and technical career fields, focusing instead on people and service-oriented careers. To investigate the relationship between career aspiration and various environmental influences (e.g., academic preparation and intellectual orientation, science-oriented hobbies, math and science courses, career information and guidance, and occupational role models), 254 black college students (111 in traditional career field programs, 143 in nontraditional career field programs), from five different colleges) completed a questionnaire assessing these influences. An analysis of the results showed that non-traditional aspirants, in addition to having higher Scholastic Aptitude Test (SAT) scores: (1) attended private, parochial, and public schools for the academically gifted; (2) were enrolled in a college preparatory curriculum; (3) participated in science activities and hobbies; (4) received more encouragement to pursue mathematics and science, and received less discouragement concerning the pursuit of math and science from parents, teachers, and counselors; (5) took greater numbers of math and science classes and had better science and math high school facilities; and (6) had more non-traditional occupational role models than their tradition-oriented peers. The findings suggest the importance of having students take a variety of math and science courses beyond the minimum requirements to ensure that they are not pre-selected out of math and science occupations and in order to develop nontraditional occupational role models. (BL)

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DISCRIMINANT FACTORS IN THE CHOICE OF A NON-TRADITIONAL "MATH AND SCIENCE-ORIENTED" VERSUS A TRADITIONAL "PEOPLE-ORIENTED" CAREER FOR BLACK STUDENTS

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ABSTRACT

Discriminant Factors in the Choice of a Traditional "People-Oriented" Versus a Non-traditional "Math and Science-Oriented" Career For Black Students

Traditionally, Blacks have been underrepresented in many career fields such as the areas of engineering, science, mathematics and other technical fields (referred to here as non-traditional fields). The majority of Black professionals work as educators, social workers, and/or social scientists. In light of the fact that most projections of occupational shortages in the future reveal that more human resources in non-traditional fields will be needed and that there will be a decrease in the supply of jobs in those fields traditionally occupied by Blacks (i.e. education, social work and social science), some of the factors which may impede and facilitate the entry of Blacks into non-traditional fields were investigated in this research.

More specifically, this research identified the relationship between career aspiration (non-traditional versus traditional) and the following factors:

1) Pre-college academic preparation/intellectual orientation; 2) early science interest; 3) career information and guidance; and 4) career field of the occupational role model. This study was conducted on a sample of 254 Black college students who aspired to non-traditional and traditional career fields.

The results of the study indicated that non-traditional aspirants, in addition to having higher SAT scores: 1) attended private, parochial and public schools for the academically gifted; 2) were enrolled in college preparatory curriculum; 3) participated in science activities and hobbies; 4) received more encouragement to pursue mathematics and science; and received less discouragement concerning the pursuit of math and science from parents, teachers and counselors; 5) took greater numbers of

math and science classes and had better science and math high school facilities; and 6) had more non-traditional occupational models.

Implications of these findings concerning the entry of Blacks into non-traditional careers were discussed. Also, implications for future research were presented.

Traditionally, Blacks have been underrepresented in many career fields such as science, math, engineering, computer science and technically-oriented professions (referred to here as non-traditional fields). The majority of Black professionals work in the traditional fields of education, social welfare, social science and theology (U.S. Bureau of Labor Statistics, Employment and Earnings, 1980). In contrast, most projections of future occupational supply revealed that more human resources will be needed in non-traditional career fields. In addition, there will be a decrease in the supply of jobs in those fields traditionally occupied by Blacks. Consequently, the purpose of the present research was to identify a set of factors which may serve as facilitators or barriers to the entry of Blacks into non-traditional fields.

More specifically, this study identified the relationship between the criterion variables of career aspiration (CA) (non-traditional versus traditional) and the following set of independent composite variables: 1) pre-college academic preparation and intellectual orientation (AP), 2) participation in science oriented hobbies (SH), 3) math and science course preparation (MS), 4) career information and guidance (CIG), and 5) career of the occupational role model (CRM) For a more detailed description of the dimensions underlying the independent composite variables, refer to Figure 1. These relationships were examined in a sample of Black college students. Hierarchical multiple regression analysis revealed that each independent variable was predictive of career aspiration beyond the affect of SAT.

METHOD

In order to measure the research variables a questionnaire designed by the present researcher was administered to a sample of 111 Black college students who planned to enter traditional career fields (TR) and a sample of 143 Black college students who planned to enter non-traditional careers (NT). The students were obtained from five different post-secondary academic institutions in the United States.

Before examining the relationship between career asiration and each independent variable via hierarchical regression analysis, the effect of the Scholastic Aptitude Test score (SAT) on career aspiration was statistically accounted for by first entering SAT into the regression equation. This procedure was conducted because previous research indicated that SAT accounted for a significantly large percentage of the variance in career aspiration. Therefore, this research tested the percentage of variance in career aspiration accounted for by each independent variable or subsets of variables beyond the percentage of variance accounted for by SAT.

FIGURE 1

CRITERION AND INDEPENDENT VARIABLES

CRITERION VARIABLE:

Career Aspiration (CA)

- non-traditional - aspiration to careers in science, math, engineering, computer science and other technical fields.
- traditional - aspiration to careers in social welfare, social science, education and theology.

INDEPENDENT VARIABLES:

Academic Preparation/Intellectual Orientation (AP)

- study habits
- reading habits
- high school typology
- high school curriculum

Participation in Science Hobbies (SH)

Math and Science Course Preparation (MS)

- number of math and science courses taken
- quality of high school math and science courses taken

Career Information and Guidance (CIG)

- amount of career information received from parents, teachers and counselors
- amount of encouragement to pursue math and science received from parents, teachers and counselors
- amount of discouragement from the pursuit of math and science received from parents, teachers and counselors

Career Field of the Occupational Role Model (CRM)

- traditional versus non-traditional

RESULTS

The preliminary results of the regression analysis revealed that all variables except AP were significantly predictive of CA beyond SAT (see Table 1).

SAT—Upon examining the first step of the hierarchical regression equation it can be seen that SAT is indeed significantly correlated with career aspiration (CA), r = .53 and accounted for 28% of the variance in CA. However, the more important points to note occurred after step 2.

Academic Preparation/Intellectual Orientation (AP)—At step 2 academic preparation is added to the regression equation. Here a significant positive correlation between CA and AP (r = .19) indicated that the two were significantly correlated and provided support for the prediciton that the higher the Black student's level of academic preparation/intellectual orientation, the greater the probability that s/he would aspire to a non-traditional career field. In contrast, a non-significant F value for the increment in R^2 due to AP (F = 5.00) indicated that the composite construct of AP did not add to the prediction of CA beyond SAT.

Math and Science Course Preparation (MS)—At step 3 it was predicted that career aspiration was significantly correlated with math and science course preparation. Therefore, the better the student was prepared in math and science, the greater the probability that s/he would aspire to a NT career field. It was also predicted that a significant proportion of the variance in career aspiration could be accounted for by MS beyond that accounted for by SAT + AP combined.

The correlation between CA and MS was .43 and was significant ($p < .001$) and provided support for the first part of this prediction. In addition, the increment in R^2 was significant as indicated by a significant F value of 9.50 ($p < .01$); thus support for both predictions was found.

Participation in Science Hobbies (SH)—At step 4 the present researcher tested the predictions that career aspiration and science hobbies would be significantly correlated; therefore, the more the Black student participated in science hobbies, the greater the probability that s/he would aspire to a career in a non-traditional field. At this point it was also hypothesized that participation in science hobbies would account for a

TABLE 1

CORRELATIONS AND INCREMENTS IN R^2 FOR REGRESSION OF INDEPENDENT VARIABLES ON THE CRITERION VARIABLE CAREER ASPIRATION CONTROLLING FOR SCHOLASTIC APTITUDE TEST (SAT)

STEP	PREDICTOR	SIMPLE R (r)	MR	MR^2	INCREMENT IN R^2	F
1	SAT	.53*** (n=125)	.53	.28 (n=110)	—	—
2	AP	.19** (n=225)	.54	.29 (n=110)	.016	5.00
3	MS	.43*** (n=254)	.61	.37 (n=110)	.076	9.50**
4	SH	.20** (n=227)	.63	.39 (n=110)	.016	5.20*
5a	CIG	.37*** (n=220)	.65	.42 (n=110)	.028	5.60**
5b	CRM	.46*** (n=254)	.66	.44 (n=110)	.047	9.44**

SAT - Scholastic Aptitude Test
AP - Academic Preparation/Intellectual Orientation
MS - Math and Science Course Preparation
SH - Participation in Science Hobbies
CIG - Career Information and Guidance
CRM - Career of the Occupational Role Model

* Significant $p < .05$
** Significant $p < .01$
*** Significant $p < .001$

significant percentage of the variance in CA beyond the effects of SAT + AP + MS. As can be seen, the simple R between career aspiration and SH was .20 and was significant ($p < .01$). In turn, the increment in R^2 due to SH was also significant ($F = 5.2$, $p < .05$). Thus these two predictions were supported.

Career Information and Guidance (CIG)—At step 5a CIG was added to the regression equation to determine if it was predictive of career aspiration beyond the contribution of SAT + AP + MS + SH. A significant simple correlation between CA and CIG revealed that the two were indeed significantly correlated and provided support for the prediction that the more career information the student receives, the more the student is encouraged to pursue mathematics/science courses and the less s/he is discouraged against the pursuit of mathematics/science courses, the greater the probability that the student would aspire to a career in a non-traditional field. Additionally, the increment in R^2 due to CIG was also significant ($F = 5.6$, $p < .01$).

Career of the Role Model (CRM)—At the last step, career information and guidance was replaced with career of the occupational role model in order to examine the relationship between CA and CRM. This analysis indicated that CA significantly correlated with CRM ($r = .46$, $p < .001$) and significantly added to the prediction of CA beyond SAT + AP + MS + SH combined ($F = 9.44$, $p < .01$). Thus, support was found for the prediction that Black students who have non-traditional occupational role model's would be more likely to aspire to non-traditional careers than Black students who have traditional occupational role models.

A non-traditional occupational role model was defined as a person who worked in a non-traditional career and had been influential to the decision of the student to enter a non-traditional career field.

Post Hoc Analysis—As you may recall, the composite of academic preparation did not account for a significant proportion of the variance in career aspiration beyond that accounted for by SAT. Therefore, each individual sub-dimension of this composite variable and its relationship to the criterion variable was examined. These relationships were explored in order to develop a new composite measure of academic preparation which would account for a significant proportion of the variance in CA beyond SAT. The sub-dimensions of this composite variables which were found to be significantly

correlated with career aspiraton were high school curriculum ($r = .35$, $p < .001$), and high school typology ($r = .21$, $p < .01$) (See table 2).

A decision was made to formulate a new composite measure of academic preparation composed of these two variables. This new variable was referred to as New AP. Next, the hypothesis that CA and academic preparation was significantly correlated and that academic preparation would significantly add to the prediction of CA beyond SAT using the new composite was retested (See table 3). The correlation between New AP and CA was significant ($r = .34$, $p = .000$) and accounted for a larger proportion of the variance in CA than did the original composite of AP. New AP also accounted for a significant proportion of the variance in CA beyond SAT as was indicated by a significant F value for the increment in R^2 ($F = 11.25$, $p < .01$).

DISCUSSION

Overall, the findings of this research are congruent with much of the literature pertaining to: 1) the pre-college academic background of Black students, in general, and math/science-oriented students (see Gilmartin, Mclaughlin, Wise, Rossi, 1976; Jones & Jung, 1976; Olsen, 1979; Sie, Markman & Hillman; 1978; Smith, 1980; Rowe, 1977); 2) career information and guidance provided to minority students (see Anderson & Fuller, 1976; Miles, 1977; Scott, 1980; Smith, 1980); 3) early scientific interests (see Bloom, 1955; Brandwein, 1955; Gilmartin et al., 1976; Zim, 1940); and 4) the importance of the occupational role model (see June & Fouks, 1980; Pallone et al., 1970; Uzzell, 1961).

All hypotheses which were previously discussed were supported, thereby indicating that career aspiration correlated with each of the independent variables. In addition, each independent variable significantly added to the prediciton of career aspiration beyond SAT and various subsets of SAT and the independent variables when a hierarchical regression analysis schema was used. More specifically, the findings provided the following types of evidences and implications:

- Black students who were enrolled in a college preparatory curriculum and/or attended private, parochial or public schools for the academically gifted tended to have non-traditional career orientations. These post hoc findings suggested that indices other than SAT scores might be used to add to our understanding of the academic environmental dynamics which might help to shape a non-traditional

TABLE 2

CORRELATIONS BETWEEN THE INDIVIDUAL SUB-DIMENSIONS OF PRE-COLLEGE ACADEMIC PREPARATION/INTELLECTUAL ORIENTATION MEASURE AND CAREER ASPIRATION

	CAREER ASPIRATION
High School Curriculum (College Preparatory)	.35** (n=254)
High School Typology (Attendance at a Private, Parochial/Religious or Public School for the Academically Gifted)	.21* (n=247)
Overall Composite of NEW AP	.34*** (n=240)

* $p < .01$
** $p < .001$
*** $p = .000$

TABLE 3

REGRESSION OF THE REVISED PRE-COLLEGE ACADEMIC PREPARATION/INTELLECTUAL ORIENTATION MEASURE (NEW AP) ON CAREER ASPIRATION CONTROLLING FOR SCHOLASTIC APTITUDE TEST SCORE (SAT)

STEP	PREDICTOR	SIMPLE R (r)	MR	MR^2	INCREMENT IN R^2	F
1	SAT	.53*** (n=125)	.53	.28	—	—
2	NEW AP	.34*** (n=240)	.57	.32 (n=112)	.049	11.25**

** Significant $p < .01$

*** Significant $p = .000$

orientation. Future research should be directed at obtaining a better understanding of the specific environmental dynamics found in such curriculum and schools. One of the objectives of this approach would be to determine if such schools provide students with greater opportunities to develop those skills and abilities which may foster a non-traditional math/science orientation or prepare them to better master non-traditional college programs and careers.

- This study also suggested that it is important for students to take a variety of math and science courses. Students should also be encouraged to take as many math and science courses beyond the minimum requirements as possible in an attempt to facilitate a non-traditional (NT) orientation. By taking a variety of these courses the student is provided with an opportunity to test out his/her interest for and ability to master math and science which is the foundation of non-traditional careers. As a result of this process, students are not pre-selected out of math and science classes before they have had an opportunity to test out their interest and competence in these areas. Furthermore, students would be provided with a chance to develop supportive relationships with math and science teachers who could become NT occupational role models. These role models, in turn, could be sources of encouragement and disseminators of career information about NT careers.

- The present research provided specific evidence to indicate that contrary to common belief Black non-traditional aspirants are not being denied the benefit of having a non-traditional role model in spite of the shortage of Blacks who work in non-traditional fields. These findings stressed the importance of the occupational role model. They also reinforced the value of career exploration programs and other activities which provides Black students access to potential NT occupational role models.

- This research further indicated that not only should a student have a NT occupational role model but participating in science hobbies and activities during the pre-college years may be influential to the development of a NT orientation. This may happen because students who engage in activities of a scientific nature obtains opportunities to examine their attraction for those activities which are related to the basic principles upon which NT careers are based. Concurrently, they are provided opportunities to interface with potential role models from

various universities, colleges and industries that may have been previously outside of the students' immediate environments.

- Lastly, evidence was found which indicated that the amount and type of CIG that students receive from parents, teachers and counselors may be influential to the development of a NT orientation in Black students. In light of this, it is suggested that parents, teachers and counselors should refrain from consciously or unconsciously discouraging Black youths from taking non-required math and science courses without having valid assessment of the students' interests or aptitudes. In those cases where there are no valid measures which would indicate that a student would not be interested in or have the ability to master a math and science curriculum, parents, teachers and counselors should openly encourage the student to test out the math and science courses. If this was to happen, Black students' decisions to take non-required math and science courses and their career orientations would be based upon their own pre-tested interests and competencies rather than on untested biased and/or stereotyped opinions.

In summary, it was found that career aspiraiton significantly correlated with each of the independent variables: AP, MS, SH, CIG and CRM. In addition, each of the independent variables significantly added to the prediction of CA beyond SAT and various subsets of SAT and the independent variables combined when a hierarchical multiple regression analysis procedure was used.

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